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POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Progress of the World

"Tells you how to do things." "Written so you can understand it."

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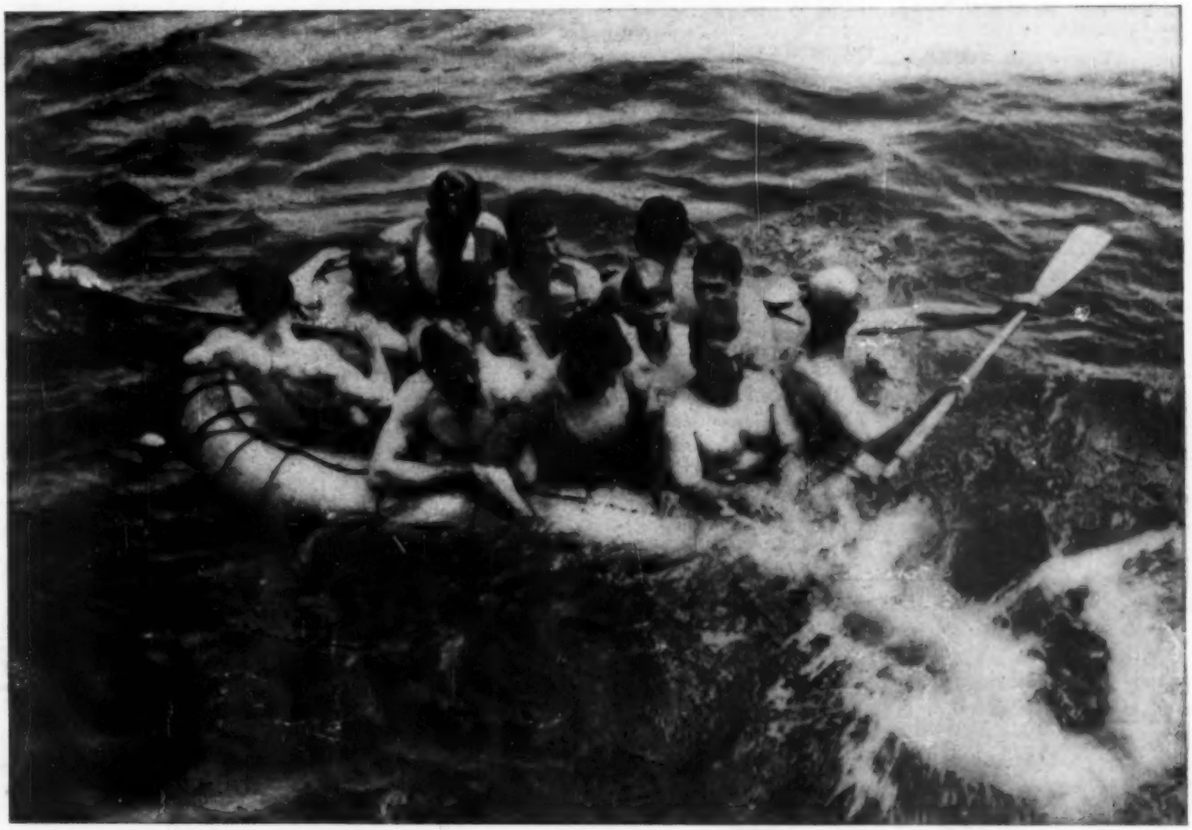
SAVED FROM PERIL AT SEA



Test of Remarkable Life Saving Float Off Sandy Hook

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SOLVES THE PROBLEM OF LIFE-SAVING AT SEA.

Remarkable Invention of a Veteran Sailor that Insures a Hitherto Unknown Degree of Safety to Ocean Travelers.

An elliptical, covered copper tube with many air-tight compartments, strengthened by flanges or fins, forms the central mechanism of a recent invention that seems destined to mark a new era in the work of like-saving at sea. Unlike any device of the kind that has ever been tested before, it cannot be capsized, collapsed or sunk and it seems to have about solved the mooted problem at which inventors of marine life-saving devices have been laboring for hundreds of years. So light that two men can toss it from the ship and so buoyant that it will support forty-five persons it is truly a marvelous contrivance that will insure to the great sea-going public a degree of safety that has never before been known.

The device is called the Carley life float—the invention of Horace Carley, an old-time sailor and veteran of many shipwrecks and disasters at sea. He had seen many lives lost from the lack of an adequate mechanism for the rescue of persons overboard. The idea of the float came to him after years of thoughtful study and as a result he has given to the world the most perfect life-saver known.

Off the Romer Shoals north of Sandy Hook, in the presence of hundreds of spectators, including officers of the revenue cutter service, representatives of great steamship lines, naval architects and prominent yachtsmen, the float was given the test illustrated on the front page, that demonstrated most conclusively its wonderful effectiveness. The smallest of four sizes of floats made by the manufacturers was used in this test. It was 8 feet long and 5 feet broad, designed to hold 15 people. It was tossed far out into the water by two men, and then 18 persons, whose aggregate weight was about 3,000 pounds, jumped overboard. swam to the float and climbed in. The men climbed on one side of it with the idea of turning the float over, but it still kept on an even keel and floated with the tide. Then oars were passed to those on the float and they paddled about until every one was satisfied the float was a success.

The air-tight elliptical copper tube, constituting the principal mechanism of the float, is covered by two inches of compressed cork and wound with canvas; the whole is made absolutely waterproof. Attached to the cylinder is a rope netting three feet deep, from which is suspended a slatted wooden bottom, that travels on rings inside the lashings. The shipwrecked persons stow themselves inside the elliptical device and unlike the so-called life-saving rafts, are not atop of a wave-swept surface to which they must cling and devote every energy to keep from being washed away.

MAKING OF STAINED GLASS WINDOWS.

One of the Largest in America Just Made in Chicago for San Francisco.

One of the largest stained windows in America has just been made by a Chicago firm for a San Francisco church. The window is a thing of beauty. It contains 5,500 pieces of glass, is 25 feet high, 14 feet wide and cost $2,000.

The stained window industry is growing to enormous proportions and Chicago is the recognized center of the art in this country. Few people who admire the beautiful tints of these windows realize the enormous amount of work required for their completion. The artist's designs are transferred to a great piece of pattern paper. A duplicate pattern is made and this is cut to pieces, each piece serving as a shape to which to cut the glass. Everything is hand work. A man with a diamond point glass cutter, having chosen his shade of glass, lays his pattern on it and following the edge of the paper with the point, cuts the glass deeply. Tapping it with the metal stub of the cutter, the glass is broken through till it presents the clear-cut figure of the paper pattern. Then turning over he cuts another piece "left hand," one to oppose the other on each side of the window's center line. Where figures of any kind appear in the design they are drawn just as are patterns for mosaics. For flesh tints of saint or prophet, for instance, glass in the lightest of flesh colors would be chosen, the shadow effects to be shaded in with the brush. These pieces with the cut pattern are turned over to the stainer. He has an easel of glass turned to the light and on its surface he sticks the pieces of glass making up the picture, each in its place. In this way, by transmitted light, he does his coloring.

When the figure work in a window has been painted the pieces must be "fired." The kiln is similar to that used for firing china. The fire is maintained from three to five hours and two hours are allowed for the glass to cool. When a window design is colored and complete in its glass sections it is ready to be put together. For this purpose strips of grooved metal are used. Edges of the glass slip into the sides of these metal strips, which are bent to the shape of the glass and, as the pattern is built up, the ends of these strips are soldered fast to the ends of metal. Copper is the most artistic and expensive of these metal frames, though lead is largely used also.

WEAKENING THE HORSE HERDS WEAKENS THE NATION.

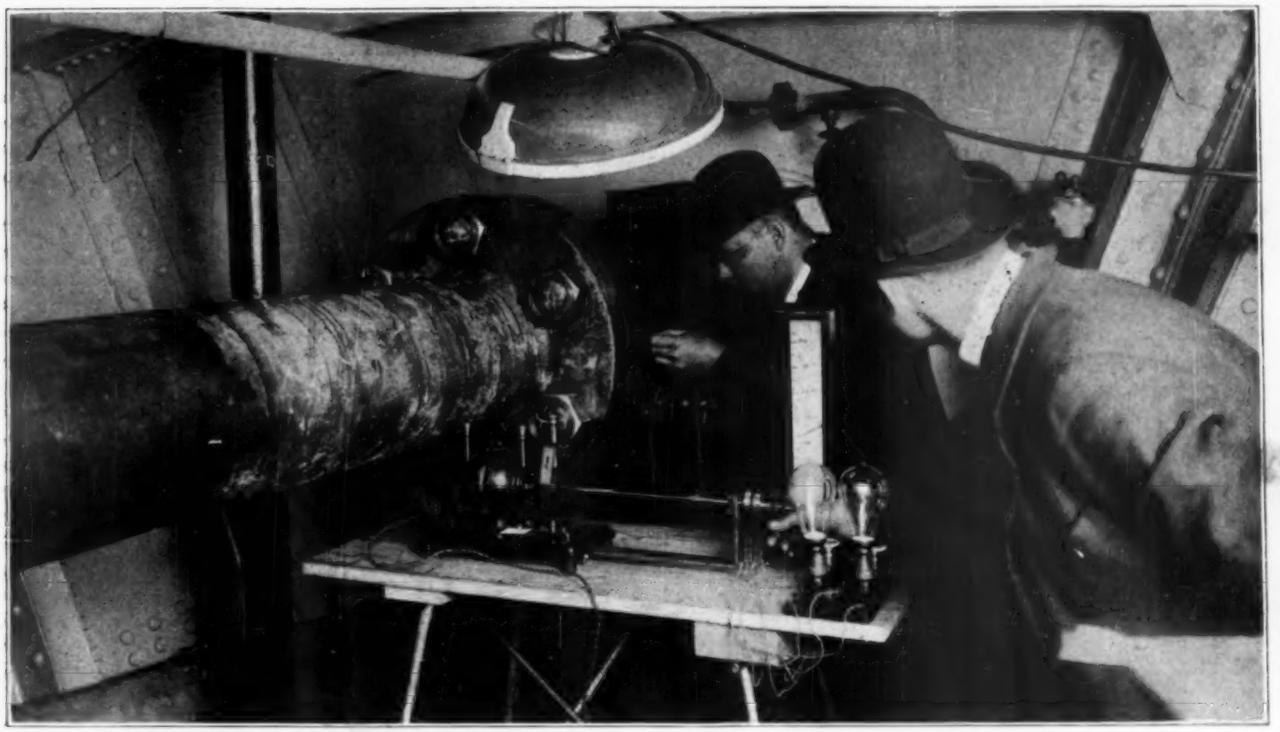
Mechanical Traction May Prove a Source of Serious Disadvantage in Time of War.

Will mechanical traction in supplanting the horse be a means of weakening a nation's powers of defense in time of war? It is foolish to deny that wherever the automobiles and other means of mechanical traction are increasing in use the number of horses are decreasing proportionately. Equally absurd is it to deny that anything of man's invention can take the place of the time-honored war horse in battle. The armored automobile or soldier's bicycle cannot swim rivers or climb mountains. The nation that has the greatest herds of horses and mules to draw on in time of war may be regarded as one of the most powerful nations. England knows well this fact since the South African war, when the nations of the earth were searched to secure enough of the animals to carry on the campaign. It was only when England had managed to obtain a sufficiency of horses and mules that she was enabled to overcome her foe and win the victory. Horses and mules won the war for England in South Africa.

Probably nowhere is the diminution of the horse more marked than in France, where the mechanical vehicles were in more general use during the last year than in any other nation. United States Consul Thornwell Haynes, in a late report from Ruin, comments upon this fact and states:

"According to last year's census Paris had 96,698 horses which could be utilized in case of war, this having been the average figure for many years; but this year the number has suddenly fallen to 90,796. This considerable diminution is said to be due to mechanical traction. The Paris Omnibus Company had last year 16,579 horses in its service; now it employs nearly 2,000 less. In all the companies which compete with the tramways and the Metropolitan railway the diminution of horses has been 2,727. The remaining 3,175 horses which, since last year's census, have passed out of service, have, therefore, it is said, been replaced by automobiles." In the Department of the Seine alone 8,000 automobiles are in use. Thus it is shown that Paris has lost 5,902 horses in one year through the increase of mechanical traction. While in America there is lack of statistics to make such comparisons, it is estimated that in New York nearly 2,000 horses have gone out of use in a year through improved street car facilities and automobiles. The decrease will be even more marked after the completion of the great tunnel system. In Chicago there are about 1,000 fewer horses now than at this time last year. The decrease is probably about proportionately great in all the larger cities.

Remarkable Electrical Instrument for Testing Steel Shafts of Great Steamers



View of Shaft Alley of Steamer, Showing Electric Experimental Gear in Place.

If you will take a spiral spring and turn the ends in opposite directions, and then release one end (note how quickly it will "untwist") you will illustrate on a very exaggerated scale what is constantly taking place in the great steel shaft of an ocean steamer when in motion.

In the August number of the Journal of the American Society of Naval Engineers—to which our readers are indebted for the accompanying illustration—is a very extended article by Herman Frahm, of Hamburg. Mr. Frahm is the expert who conducts tests on important marine machinery. The steel propeller shaft of a big ocean vessel, especially a man-of-war, is a mammoth affair, two or three feet in diameter, weighing hundreds of tons, and is as important to the operations of a ship as is the back bone to a man. Propellers are manufactured by the most experienced of workmen, from the highest grade of metal obtainable, for the breaking of a shaft when at sea hundreds of miles from land is a very serious affair. Navigators are in constant fear of an accident of this kind, and this reason, quite as much as to secure speed, has led to the use of a double set of engines, shafts and propellers. Until recently there has been much of mystery in these fractures which frequently occur during fair weather, and in steel which was found to be good. The peculiar fact that occasionally the lines of fracture of the broken shaft resembled those caused by twisting actions pointed toward the existence of considerable twisting moments, but an explanation as to their origin could not be given. It is now known that these shafts "twist" and "untwist." Sometimes they fail to untwist—then they break.

Mr. Frahm devised a very sensitive electrical apparatus, which traces a record on a thin sheet of prepared zinc by means of an aluminum needle. Two machines are necessary, and are placed in contact with the revolving shaft as far apart as possible. Both instruments are started or stopped at the same instant by an electrical device. Comparisons of the two records disclose the amount of "twist" which occurs. Mr. Frahm says:

In large steamers the distance between the power-generating engine and the power-absorbing propeller is, as a rule, quite a considerable one. It is therefore obvious that the whole of the shafting, in consequence of its length, must be regarded as a more or less elastic torsional spring, and not as an absolutely rigid body. This "spring" is kept twisted by the turning moment transmitted from the engine to the propeller. If we had to deal with motors possessing constant turning moment, such as electric motors or steam turbines, the whole system, including the propeller, would revolve uniformly, assuming the resistance of the propeller not to vary, the shafting consequently being subject to a constant moment, and hence retaining a constant "twist" throughout the revolution. But the case is different when the turning force is no more constant, but subject to oscillations such as take place necessarily in steam engines with reciprocating pistons. In this case the shafting also will show oscillations of the twisting stress, and consequently of the amount of twist, as well as speed.

AUTOMATIC PEACH-PARING MACHINE.

A machine for paring peaches, which may revolutionize the canning industry, has been invented by L. F. Graham. The device operates automatically. It is composed of a wheel 3 feet in diameter, placed horizontally on a revolving axle. On the outer edge of the wheel are a score or more of metal cups. The fruit is split by hand and a half peach placed in each cup. The wheel revolves and passes beneath an automatic arm with knife attachment. The cups holding the fruit revolve independently and through this action, and the forward and downward movement of the knife-bearing arm, the half-peach is quickly shaved of the skin. The wheel carries the cups around and deposits the peaches in a box. The size of the peach makes no difference as the cups adjust themselves automatically to the surface, whether large or small. One attachment will operate two of these machines and each machine does the work of half a dozen workers.

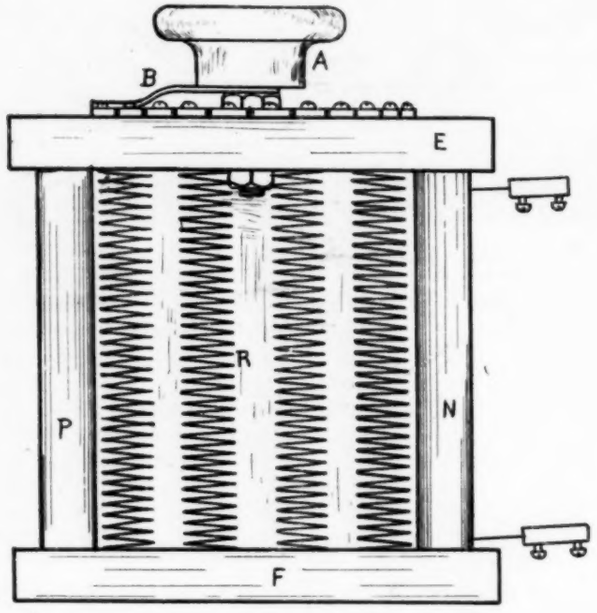
Easy Electrical Experiments

By L. P. Dickinson

HOW TO MAKE A RHEOSTAT.—PART I.

Electrical conductors, because of an inherent property called resistance, have the power of limiting the value of an electric current. The greater the resistance in an electric circuit, the less the current, other things being equal. For this reason, resistances are made use of to control the strength of electric currents. When a resistance is so arranged that its value can be easily and quickly altered, it is called a rheostat.

A very convenient method of arranging such a rheostat is shown in the accompanying figure. It consists of three essential parts—a wooden frame, consisting of two end pieces E and F, supported by wooden pillars N and P, 32 coils of iron wire shown at R, which furnish the necessary resistance, and a dial at the



top to which these resistances are connected, so that any desired number of the 32 coils may be connected into circuit.

To make the wooden frame-work, take two pieces of whitewood or pine, 9 inches square, and ⅞ inch thick. Also make four wooden rods 1 inch in diameter and 9 inches long. Near the corner of each of the square pieces bore a hole, whose center is one inch from each edge. The hole is ¾ inch in diameter. Cut down each end of the wooden rods to a diameter of ¾ inch for a distance of ⅞ inch from the end, thus forming a shoulder so that the square blocks of wood may be tightly slipped on to the rods, forming a framework which will support the whole apparatus. Make all joints to fit tightly, and sandpaper the whole off smoothly, and fasten the whole together with screws as shown.

From a piece of sheet copper 1-16 inch thick, cut out a ring whose outside diameter is 7¾ inches, and whose inside diameter is 4¾ inches. The cutting can be done with a pair of tinsmith's shears. Draw lines upon this ring with the sharp point of a knife, dividing it into sixteen equal parts. With a small drill bore two holes in each of the sections, these holes being ¼ inch from the outer edge of the ring. With a hack saw, or the edge of a thin file, cut the ring into sixteen sections along the lines previously drawn. During this process, the ring should be held firmly to an old piece of board, by a ⅝ inch screw passing through each of the thirty-two holes in the ring. The piece of board may be thrown away after it has been used.

On the top of the wooden frame first constructed, draw a circle 7¾ inches in diameter, its center being at the center of the top. Divide it by pencil lines into sixteen parts, and with this circle as a guide, transfer the sixteen copper sections from the old piece of board to the top of the rheostat, arranging them symmetrically around the center. Be very sure that they do not touch each other, and that they lie smoothly and firmly in place. It may be necessary to file their edges a little in order to make them fit into each other well without touching.

In the center of the top bore a ⅜ inch hole. Procure a ⅜ inch stove bolt, 3½ inches long, with a flat head. It should have two nuts, so that it may be clamped in position in the hole just bored, one nut being on the upper surface of the top of the rheostat, the other on the lower surface.

Make a wooden knob shown at A, 3 inches in diameter, with a hole through its center which will allow it to just turn freely upon the stove-bolt, the hole being countersunk at the top to receive the head of the bolt. To the under side of this knob fasten a strip of spring brass shown at B, which is ¾ inch wide, 1-16 inch thick, and about 4½ inches long. It has a hole bored through one end at a distance of ⅜ inch from that end, the hole being ⅜ inch in diameter. The bolt is then slipped through the knob, the spring is slipped over the bolt, and then the spring is securely fastened to the knob by three flat head brass screws.

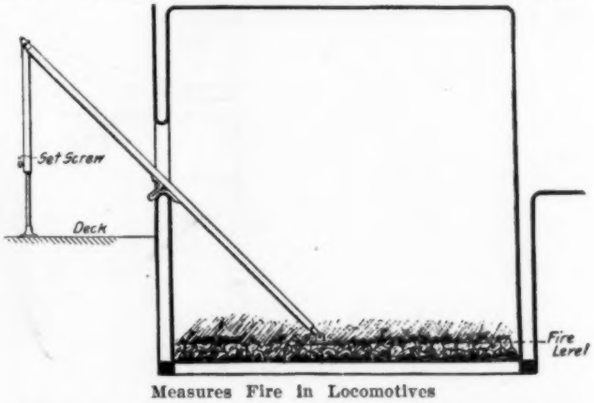
The bolt with the knob in place is then secured to the top of the rheostat, at such a height that the spring will bear firmly upon the copper sectors already in place. The knob with its attached spring should then turn freely upon the bolt, so that the spring may touch any one of the copper sectors.

There should be inserted between the spring and the upper nut on the bolt, two thin washers made of spring brass. These washers should be bent slightly so as to exact a pressure between the spring and the nut, keeping them always in contact. These washers are very important, and should not be omitted. In the next paper we shall see how to complete the rheostat.

(To be continued October 25.)

THICKNESS OF FIRE ON A LOCOMOTIVE GRATE.

Tests were made at Purdue University of the relative value of a fire of various thickness. Locomotive firemen usually keep a fire of from 10 to 12 inches thick. In making the tests a



Measures Fire in Locomotives

simple device was used, as shown in the cut. The arm was made of 1-inch pipe, which was inserted through the fire door. At the lower end a flat shoe rested on the top of the fire, and a guage set up on the locomotive deck furnished the readings.

Steel wool is being used as a substitute for sand paper. On account of its flexibility it can be made to reach irregular surfaces. The operator should wear gloves to prevent the broken fibers from entering the fingers.

LAUNDRIES OF THE WORLD

THE LAUNDRY AT NICE.—This city is one of the most popular resorts of southern Europe. It is thronged with visitors both winter and summer and the inhabitants practically live on what they obtain from their guests. This naturally gives the laundry business a boom. The picture offered here is a familiar and an interesting one to tourists. The stream shown is the river Paillon and the water coming down from the mountains is clear and soft and affords admirable results for laundry work. No doubt some of the wealthy American heiresses jabber bad French when their dainty fabrics are sent back because they lack the finish of a steam laundry. It is occurrences such as these that make them appreciate home enterprise.—National Laundry Journal.

MADE INSANE BY "HELLO" CALLS.

Telephone Girl, Crazed by Bells Ringing in Her Ear, Commits Suicide.

Miss Lillie Crum, for two years an operator for the Chicago Telephone company, was made insane by the never-ending "Hello" rung into her ear while at work, and committed suicide to end her agony, according to a verdict of the coroner's jury. "The evidence showed," said Deputy Coroner Buckley, "that she labored under a great mental strain. Answering imaginary calls on an unseen switchboard in a fictitious central office must have been the cause of her insanity and suicide." The mother testified that the girl would start from her sleep in the night with the ready answer, "Hello! What number, please?" It is believed by some that the metal headpiece which supports the receiver, a mechanism greatly disliked by most of the telephone girls, added to the mental strain that led to Miss Crum's insanity. The girl was 18 years old, and lived with her mother at 509 West Ohio street, Chicago.

A freight train on the O. R. & N. Co. was caught in a land slide near Bonneville, Ore., and buried in rock and earth. The crew miraculously escaped.

Popular Mechanics tells you how to do things and "is written so you can understand it."

BALL BEARING BOX CARS.

Wonderful Economy May Result from Experiments on the Illinois Central.

A complete metamorphosis in the freight carrying business may result from experiments being made on the Illinois Central railroad with a box car, the trucks of which are fitted with ball-bearing journals. They made the car run so easily, it is claimed, that a single person could move it. The bearing consists of four races of three-quarter inch balls. The latter are built to take the thrust of the car when going around a curve. There are 132 three-quarter balls in each journal, each of which will sustain a crushing power of 78,000. The smaller balls will sustain a weight of 38,000 pounds. The car in question was loaded with 80,000 pounds of steel casting. It made the trip to New Orleans, where it was loaded with coffee and returned to Chicago. It is stated that the journals will have an average life of seven years, which is much longer than the journals now in use. But the most important advantage claimed for them is the great ease with which they can be moved. If practicable, it is claimed, train loads can easily be doubled and hauled with the same power now used.

The Adriatic Railway in Italy is laying a number of concrete steel ties. The ties are 8.53 feet long and the shape of the cross section is a triangle with the corners cut off.

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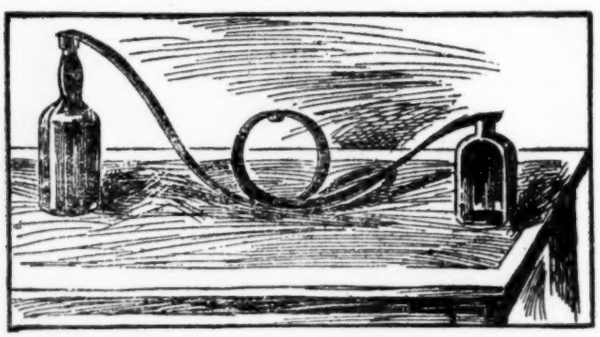
A TABLE LOOP-THE-LOOP.

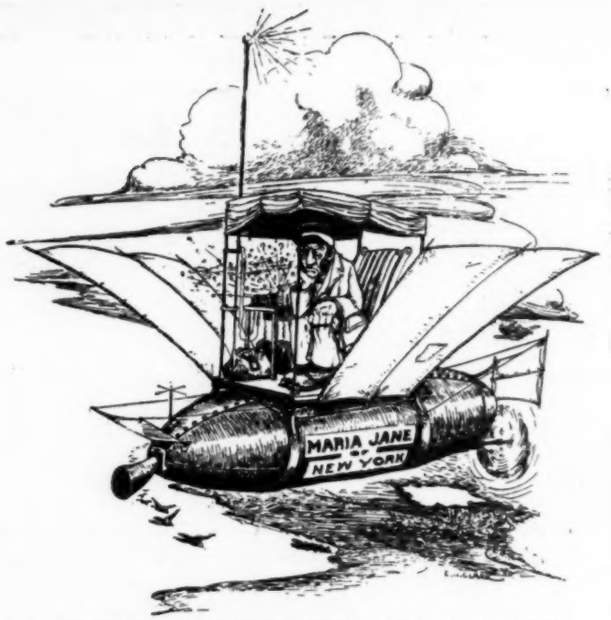
Here is a simple experiment, and one which admirably illustrates the working of centrifugal force. Take a long strip of cardboard and, after bending it in the middle, fasten the upper end of it by means of a peg or pencil to the cork of a wine bottle. Next fasten the lower end in a similar manner



Looping the Loop.

to a bottle which is only half the size of the other one. The loop in the middle of the cardboard must be perfectly uniform and the cardboard itself must be of precisely the same breadth throughout.

We now have a railroad, and the next thing is to make use of it. This is done by allowing a little wooden roller or caster to run over it. The roller, which must not be broader than the cardboard, will run swiftly from the highest point of the road to the very end, passing safely through the loop and never swerving a hair's breadth from the proper course. If we want to run a car, all that is necessary is to turn up the edges of the cardboard so as to prevent the wheels from running off and to place on the track a vehicle instead of the roller.



"Confound this Wireless Telegraphy. My wife has been talking to me ever since I left home."—Life.

RECORDS TELEPHONE TALK

It Is a Great Invention, but in Practice Is Something of a Nuisance.

Secret conversations over the telephone, swearing at the operator when she connects you with every other 'phone in town except the one you want, talking to your wife from the club when you are supposed to be hard at work in your office will all be joys of the past when the telegraphone, a new invention, comes into general use. Instead of being a public benefit, it will do away with the hundreds of little conveniences for which our present telephone system is so valuable. This device records all conversation sent over the wires, so that a wife may slip into her husband's office and by pressing a button hear every word her husband has spoken over the wires for the past month. The conversation is recorded on a steel wire or tape and can be reproduced at any time and as often as desired without the record's deteriorating. In this apparatus a steel wire or a steel band is moved with considerable velocity between the poles of a small electro magnet. On speaking into a telephone transmitter joined on the circuit the undulatory currents set up in the transmitter react upon the electro-magnet and cause a continuous variation in the direction and degree of magnetism at the poles of the electro-magnet. These variations are permanently recorded on the steel wire as it rushes by and when the message is complete the steel wire retains a definite record of what has taken place in the shape of a series of transverse magnetized lines varying throughout in their polarity and in their strength. On connecting a telephone receiver to the electro-magnet and again starting the wire in its course the magnetized wire generates electric currents in the coils of the superimposed magnet as it passes between its poles, and these electric currents, which are the exact counterparts of those generated by the original voice, cause the telephone to repeat what was said in an almost perfect manner. The telephone is the invention of Peter Oluf Pedersen, of Copenhagen.

The Boston & Maine Railroad, as a result of the high price of coal, has decided to burn wood in all stations along its line this winter and as a result has placed orders for several thousand cords of hard wood.

THE REFERENCE LIBRARY.

Just the thing the mechanical world has long been waiting for is the Reference Library of Modern Engineering Practice, published by the American School of Correspondence. It is written and compiled by some of the foremost engineers of America and represents years of study, the most thorough scientific research, and a perfect knowledge of actual shop practice and conditions. It is the most complete and reliable work of the kind ever published in any language and is destined to be a means of a higher scale of advancement to the American mechanic and the technical student. For this work as a reference guide is a stepping stone that will enable the American mechanic to make a far more rapid progress in the attainment of his goal. Its beneficial influences are bound to be felt throughout the nation as engineers and engineering students have long been handicapped through the lack of such an assistant.

The Reference Library consists of ten volumes. It is intended as a guide for engineers, mechanics, machinists and students, illustrating and explaining the theory, design, construction and operation of all kinds of machinery. It contains more than 4,000 pages, illustrated with more than 2,000 valuable diagrams, working drawings, full page plates and engravings of machines and tools. It forms a complete reference library on the best and latest practice in the machine shop, engine room, power house, electric light station, drafting room, boiler shop, foundry, pattern shop, blacksmith shop, round house, plumbing shop and factory. In fact it completely covers the field of engineering and mechanics in every department. A feature that makes the work additionally valuable is its excellent and convenient arrangement, which is so that any information on any mechanical or engineering subject may be found almost as readily as if turning to a word in the dictionary.

Besides the general technical information for general reference the work contains many special articles on such subjects as "wireless telegraphy," "flying machines," etc. While the first edition has but recently been issued from the press, it has already created a great stir in engineering circles in both America and Europe. Already the Austrian Government school at Budapest has ordered a set of the books. The letter from this school states: "In accordance with Prof. Domotor's proposition, we beg you to make an exception to your rule and send us a set of this Reference Library." From technical schools everywhere the requests are coming in by every mail, all seeming to recognize the want that is filled by this remarkable work.

The "Reference Library" is edited by Frank W. Gunsaulus, president of the Armour Institute of Technology, assisted by a corps of 25 distinguished specialists and technical experts. The volumes of the first edition are exceedingly handsome. It is an excellent edition de luxe, printed on special paper with wide margins, handsomely and substantially bound in rich three-quarters red morocco leather. No pains or expense has been spared in its publication and its publishers give it but mild praise when they say: "It is the first really great engineering reference work of a thoroughly extensive and practical character that has ever been published."

The student and the practical mechanic not equipped with this splendid instructor and source of information will suffer material disadvantage in his efforts to keep pace with those who are so fortunate as to be provided with the valuable work.

During the past year there were 43,973 applications at the patent office for mechanical patents, 2,361 applications for design patents, 115 for reissues of patents, 2,410 for registration of trade marks, 1,064 for registration of labels and 233 for registration of prints. There were 27,292 new patents issued.

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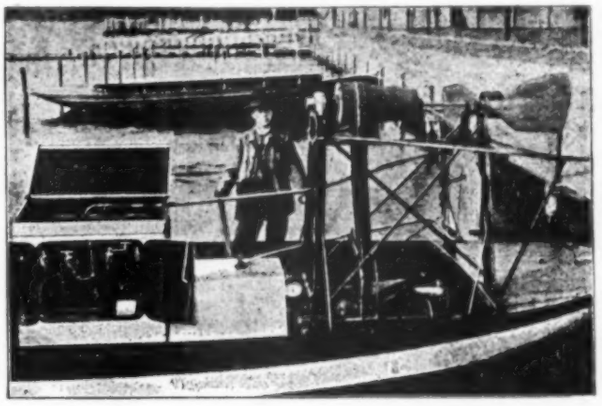
WINDMILL BOAT SKIPS OVER MUD AND SANDBARS.

Unique Yacht, That May Run on Ice and Water, Invented by Zeppelin.

A windmill boat propelled by a gasoline motor driving an air propeller is attracting great attention in German scientific circles. It is the conception of Count Zeppelin of dirigible balloon fame. The boat cuts its way through water plants, sails through sea-



Boat with Air Propeller.

weed and skips over sandbars and through mud banks without difficulty. It is proposed to further perfect the yacht by providing it with steel runners so that it can rise out of the water and continue its course over snow and ice without ever stopping.

All who witnessed the trials of the boat were mystified at its silent, steady, swift advance. It seemed to glide over the water rather than cleve it, which seeming phenomenon is explained in that the boat has a draught of only about 11½ inches.

The Automobile Review says: "The water used in cooling the motor is taken from an inside reservoir and traverses a radiator analogous to those used in automobiles. Transmission of power is obtained by means of a belt passing over two cone pulleys by means of which the speed can be adjusted to a nicety. The boat is capable of a speed of nine miles an hour."

La France Automobile says: "Count Zeppelin constructed this boat primarily for the purpose of testing the efficiency and power of different screws, with a view to the propulsion of his dirigible balloon, the idea of which he has not yet abandoned.

A SIMPLE BEAN PICKER.

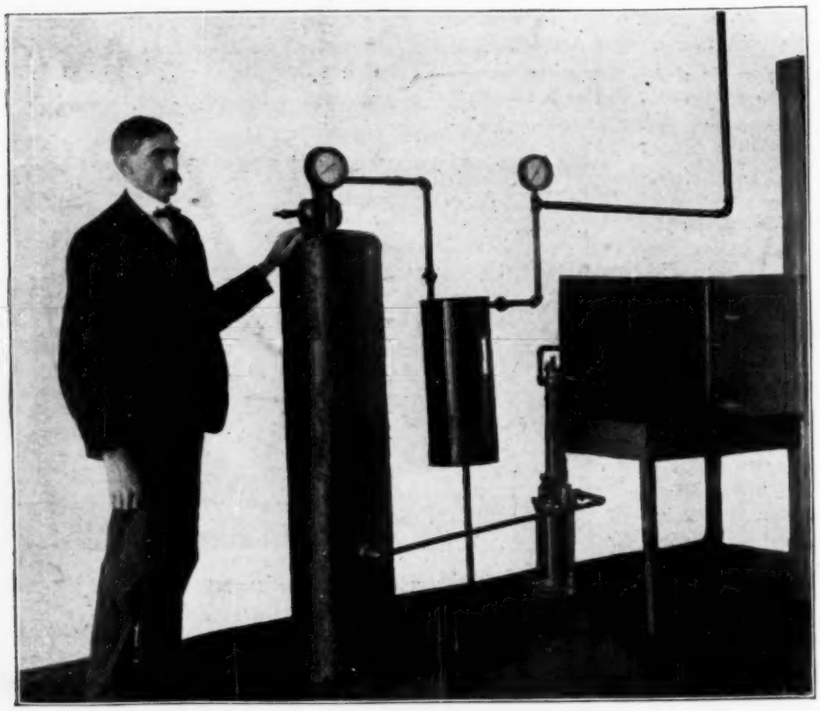
Bean picking machines are simple of construction and may be run by motor or foot power. An efficient "bean picker" consists principally of a hopper and an endless canvas belt. The belt is six or more inches wide and two feet long. The beans travel from the hopper toward the operator. The operator picks off the culls and drops them into receiving pockets directly under each hand, the good stock passing into a basket, thus saving the time and work of spreading and scraping off, as in table picking.

MOST PERFECT RUBBER SUBSTITUTE.

Probably the most perfect substitute for rubber is "corn rubber." The layman cannot tell it from the product of the South American rubber tree. It resembles rubber even in smell. "Corn rubber" is made of corn oil, which is treated with sulphur and baked in order to make real rubber of it. It can be sold for one-tenth the price of Para rubber and it is used in making rubber boots, bicycle tires, sheet rubber, water proofing, rubber heels, linoleum, and in fact in nearly all classes of rubber goods.

Burns Air--Produces Terrific Heat

Remarkable Discovery that May Free Americans from the Talons of the Coal Trust



Croslen and His Air Burning Machine.

What is the use of burning coal anyhow, when that fuel is so expensive? Why not burn air? Air is so much cheaper and there is an exhaustless supply. It is a supply that will defy the efforts of trusts to control. It is as free to the beggar as to the millionaire and is the greatest source of heat. Of course certain chemical combinations are necessary to make air produce heat. When you are burning coal it is the air that makes the heat and the coal is merely an agent for producing these chemical combinations. Therefore, why not use some other agent for producing this chemical action and thus make air produce the heat without the necessity of using coal?

That is the way a Chicago man has been arguing and he has found the necessary agent by which any person may have all the heat he desires by simply burning air. The agent that brings about the chemical combination necessary to make the air produce the heat and light is a hydro-carbon oil of his own preparation which he can furnish to any one in limitless quantities at a price as cheap as coal oil or gasoline. His may be regarded as one of the most important inventions of the day. It seems to have solved the fuel problem without waiting for an end of the coal strike and people may now have heat and light at one-sixth the price they have ever paid for it before. The inventor is William T. Croslen, a lifelong student of the subject of compressed air, the main factor in this wonderful system of heating and lighting. A company has been organized with Mr. Croslen as president to manufacture and install the heating and lighting plants for residences, stores, factories, furnaces, smelters, steamships, automobiles and for any and all places requiring light, heat or power. The method produces the most powerful system of lighting and heating ever known, as a result of which every owner of a house, store or factory can have his individual heating plant and be independent of coal and gas trusts at a cost insignificant in comparison to what he has paid before.

The principle of the system is based on the theory that the greater amount of oxygen that is admitted to the chemical combination producing combustion, the greater will be the heat. Therefore compressed air is forced through the hydro-carbon oil, and the air when it comes out is laden with carbon and hydrogen in sufficient quantities to produce the chemical combination of combustion. The air, which by its admixture with the other elements, has now become a gas, is lighted and a terrific heat is the result.

A test of the device was given in the presence of a Popular Mechanics representative, which demonstrated that the system is all that is claimed for it. An air receiver, a carbonator (or agitator) and an air pump are the requisites in the installation of the Croslen system. The hydro-carbon oil is placed in the carborator and the air is forced through it from the compressor by the use of a Croslen regulator, which is the only known regulator that can gauge as low as one-tenth of an ounce. The air after being forced through the oil and becoming a gas is run through gas pipes to the stove, furnace, lamps or wherever desired for light or heat. The gas that the engine produces by compressing the air operates the engine, itself, a feat somewhat akin to perpetual motion. It is started by a sparker. There is always enough air in the tank to place the machinery in operation. The entire output of a well known engine company, which makes the strongest engine of its size in the known world, has been bought for the operation of the Croslen heat and light system.

The company organized for the purpose of manufacturing and installing the Croslen heat and light system and other Croslen inventions is known as the National Light, Heat and Power Co.

Several attractive offers for the entire stock have been refused, the company preferring a large number of small stockholders. For this reason the stock has been issued in shares of $10 each, which are now being sold for $5 per share. Because of the great number of applications it is expected that the stock will all be taken up in a short time. Already floods of applications have been received for the installation of lighting and heating plants and agents from Maine to California are clamoring for contracts.

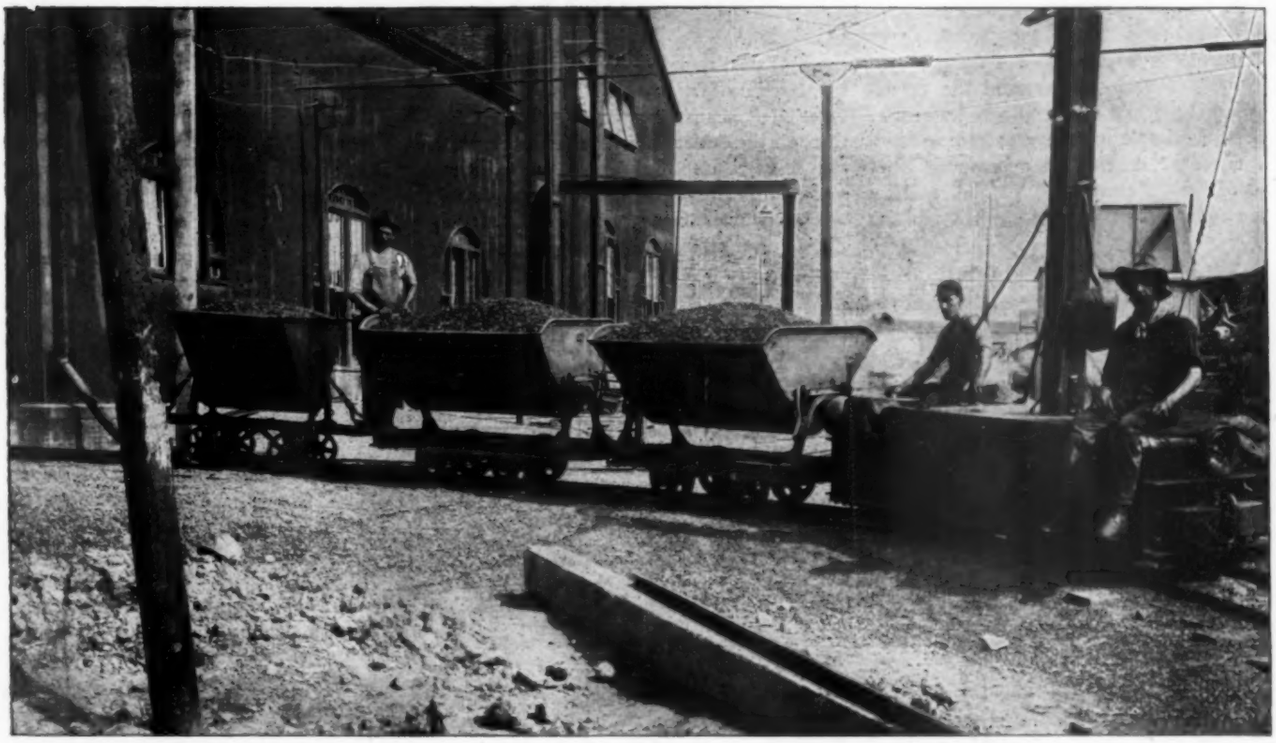
The company expects to erect an extensive plant near Harvey, Ill. A site and special inducements have been offered by residents of that city. Plans for the buildings have already been drawn. The main building will be 80 by 400 feet, four stories high.

LOADED TRAIN OF 104 CARS.

One engine on the Lehigh Valley road hauled 104 loaded cars in one train which weighed 4,013 tons. The run of 82 miles was made in six hours. This is supposed to be the largest train ever hauled by one locomotive, and was nearly a mile in length.

VISIBLE SPEED INDICATORS FOR AUTOS.

A Minneapolis architect has invented a speed recorder for automobiles, with dials on each side of the vehicle and figures and a pointer which can be read from the sidewalk. There are two hands, one of which returns to zero when the auto comes to a stop while the other remains at the speed numeral for five minutes. The device is likely to be more popular with the police than automobile owners.



The Brooklyn Rapid Transit Co. has a miniature electric railway in its power house. It is narrow gage and small cars are hauled to remove ashes from the boiler room. It is, however, a complete electric railway. The motor car is the one at the right, and was built by Baldwin Company, and equipped with Westinghouse motors. It is very powerful.

SPANKS HIS CHILDREN AND CURRIES HIS HORSE BY ELECTRICITY.

The inventive genius of a retired hardware merchant living on Long Island has almost succeeded in abolishing manual labor from his home. His wondrous achievements were all made possible by an innocent looking windmill in the rear yard. This windmill operates a dynamo which connects with storage batteries, furnishing electricity for every need. Electricity cooks the meals, sweeps and dusts the rooms, rocks the baby's cradle, lights the house and grounds, opens and closes the front gate, curries the horses in the stable, exterminates the mosquitoes, alarms the household when a burglar enters; an electrical spanker punishes the youngsters and the inventor is now working on an electrical lawn mower.

HOW TO MAKE CURVES IN CEMENT WALKS.

G. S. Neff, of Rochester, N. Y., tells in Municipal Engineering how to make neat curves in constructing cement walks.

Get a few lengths of common strap iron 4 inches wide and 3-16 inch thick. I have three pieces, 18, 16 and 10 feet long. With these I make all my curves and long turns, except that for short curves I use an old buck-saw blade, of which I have three, and six clamps to fasten the ends of the saw blade to the wood frame. With these six pieces I have been able to make any curves desired. The strap iron pieces can be staked to line like a piece of scantling, but they cannot be bent to very short curves. For them the steel saw blades or similar thin straps must be used. In setting the latter, first put the stringers in proper position and stake them securely. Then bend the steel blades to them in proper curve and secure with the clamps. Bank earth on the outside, fill in the concrete and finish in the usual way, and you will have a neat job. In placing stringers, I set them to line, stake on the inside and bank with earth on the outside if possible. The earth will hold better than stakes. If any kinks get in the strap irons, lay them on a stringer and hammer them out. In transporting from one job to another lay and tie them on a 2 by 4 stringer to keep them straight.

SWALLOWED HIS TEETH—SAVED BY COTTON SANDWICH.

Hereafter when you swallow a pin, or a needle, or a tack or a hatchet, just eat a cotton sandwich and you will probably survive. One sandwich is enough for an ordinary case. That was all that was necessary to save a man who had swallowed his teeth, according to the British Medical Journal. The man was swimming when his metallic plate of false teeth became dislodged and he swallowed plate, teeth and all. Dental Hints, in speaking of the case, says:

"On the man's arriving at the hospital a probing was used and the denture passed on into the stomach, where it set up severe pains at the pyloric end which continued for some days. Dr. G. J. Johnston then hit upon the successful expedient of feeding the patient with sandwiches, each containing a thin layer of cotton. A week after the man's admission an aperient of licorice brought away the denture encased in cotton."

Dental Brief says: "One gentleman feared that cotton so administered might induce obstruction. Well, so might the denture. But the cotton, as events showed, might bring away the dangerous pointed plate in harmless form; and if it didn't one laparotomy would do for both plate and cotton."

Two yard engines that are operated from the left side of the cab have recently been placed in service by a St. Louis brewing concern. This is done that the engineer may sit on the fireman's side when rounding certain curves in order to receive signals more handily.

How a Gasoline Engine Works

How many people who are using a gasoline engine really understand the principles of its operation? and yet the entire process is simple and easy to comprehend. An excellent description appears in London (Eng.) Motoring Illustrated, of how the gasoline engines used on automobiles operate.

A gasoline motor consists essentially of a crank-shaft, a cylinder, and a piston, the cylinder being fitted with some or another device for introducing the charge of fuel into it, and with a sparking apparatus for igniting this fuel, the heat of combustion and the expansion resulting from such heat being the force which drives the piston forward and turns the crank.

The device for introducing fuel charge by charge for each explosion in the cylinder is an inlet valve which admits a properly proportioned mixture of carburetted or gasoline-laden air. There is also an exhaust, or outlet valve, which permits the discharge (or exhaust) of the products of combustion. The piston, driven out of the cylinder by the sudden enormous expansion resulting from the heat given off by the ignited charge of gasoline and air, is in connection with a crank shaft, which again is conected with the driving wheels of the car in such manner that the wheels are set in motion by its revolutions. From the gasoline tank, by means of a float for regulating the fuel level, and a needle valve for adjusting the proportion, the gasoline is admitted to the fuel mixer or carburettor, where it commingles with air. The carburettor communicates with the cylinder by means of a valve. This, opening under suction with each forward movement of the piston, admits the mixed gasoline and air ("the charge") into the cylinder. But the expansion resulting from the firing of the charge by means of the electric spark (this is taken as being the most general form of ignition), while it drives out the piston, at the same time closes the valves, until the cylinder is once more ready for the next charge.

Before the cylinder is ready for the next charge, however, it must be freed of the hot products of combustion, which, having accomplished their work of pushing the piston, have no further use. They are, therefore, an "exhausted charge"—got rid of through the outlet valves, which are opened for this purpose by a cam operating at every second revolution of the motor.

The cylinder being thus freed, another charge of gasoline and air sucked in by the outward stroke of the piston through the inlet valves is compressed by the inward stroke of the piston. The electric spark once more ignites it, explosion of gases and expansion occur, and once again the piston, driven violently out of the cylinder, turns the crank shaft, which in its turn transfers the power to the road wheels. Again the cylinder is emptied through the outlet valves and again is ready for another charge.

The accompanying series of diagrams explain at a glance the four successive periods—Intake, Compression, Explosion, and Exhaust of the Gasoline Process.

Each period is illustrated by two diagrams placed on the same level; the first, showing the early, the second showing the completed, stage.

In Fig. I, the Intake Period is illustrated. In the first diagram the piston is pushed to the extreme end of the cylinder; the Exhaust Valve, having discharged the exhaust, is now shut tight; the Inlet Valve opens, admitting the charge, which, with its direction, is shown by the small arrows. The second diagram shows the completed stage of the same process, the cylinder being now quite filled, the sucking action of the receding piston having drawn in the charge.

Fig. II shows the Compression Period. The Inlet Valve, having admitted the charge, is, as the piston returns into the cylinder, closed by the pressure thus exerted. The second diagram shows the piston once again well into the cylinder, compressing the charge. Should the inlet valve be defective, the charge will under this compression be driven out through it, and so less than a proper charge will remain for explosion.

Fig. III illustrates the Explosion Period. The compressed charge is now ignited by the electric spark. Immediately combustion of the explosive gasoline-and-air mixture takes place, with sudden, immense expansion of hot liberated gases. Inlet and outlet valves being tightly closed, the whole force of the explosion expends itself upon the piston, driving this violently out of the cylinder. The second diagram shows the cylinder filled with the heated products of combustion, having driven out the piston to its furthest limit.

Fig. IV is the Exhaust Period. By the operation of a cam the exhaust valve is now opened. The hot products of combustion rush out into the exhaust-box, and are further driven out as the piston returns into the cylinder. The second diagram shows the piston far back in the cylinder, the exhaust gases being still thrust out through the opened valve. Then the process starts over again from Fig. 1. The exhaust valve closes, the piston being withdrawn once more from the cylinder by the revolution of the crank-shaft; the inlet valve is again sucked open; a charge withdrawn; and so the periods are repeated.

Thus it will be seen the engine makes two complete strokes or revolutions for each explosion, hence the necessity of a flywheel to carry it over one stroke or cycle. The spark to ignite the charge may be furnished from an acculator or battery, or by a small magneto driven by a belt from the flywheel. In order to temper the great heat resulting from the repeated explosions in the cylinder, it is surrounded by an outer wall called the water jacket: through this space water constantly circulates by means of a small pump. To pre-

FIG. 1. INTAKE PERIOD.

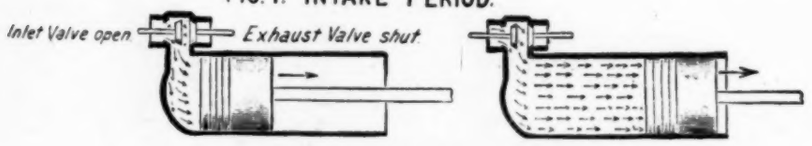


FIG. 2. COMPRESSION PERIOD.

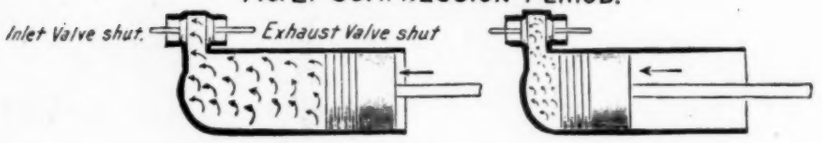


FIG. 3. EXPLOSION PERIOD.

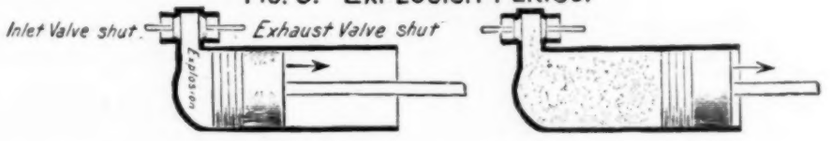
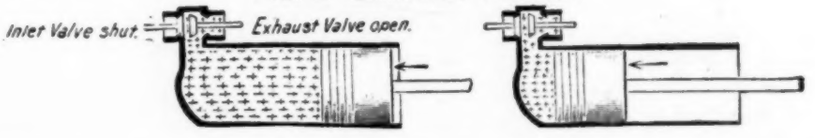


FIG. 4. EXHAUST PERIOD.



vent the loud explosive noise made by the exhaust it is passed through a receptacle called a muffler. The failure of any valve to work exactly as and when it should, imperfect sparking, or too much or too little lubrication will prevent the engine from working.

DING-DONG OUSTS PING-PONG.

Ping-pong is old. Ding-dong is the latest. Ding-dong is a kind of musical ping-pong. It was invented by Miss Edna Burt, an actress. It consists of a Japanese screen perforated with large holes, over which are printed Japanese characters. Crossing the holes on the inside is a large wire connected with a bell. When the ball strikes the wire the bell rings. The significance of the characters over the holes changes with each game according to a secret chart. Amusement is provoked in the summing up of the scores, many of the most enticing looking characters and holes being forfeits instead of values.

PORTABLE IRRIGATOR.

An irrigating garden fork has been constructed by a Florida gardener for the purpose of introducing liquid fertilizer or water to the roots of growing plants. The handle of the fork is a big syringe, and

Waters the Roots.

each of the prongs is hollow, with a hole near the end. The fork is thrust into the ground and the contents ejected without removing any earth from around the plant.

DR. GATLING INVENTS AN AUTOMOBILE PLOW.

The next thing to beating swords into pruning hooks is the recent invention of an automobile plow by Dr. Gatling, inventor of the most deadly gun ever made. At the age of 70 years he has devised a combined plow, harrow and seeder, which can be operated by a woman while riding in a comfortable seat. A gasoline engine furnishes the power to plow 30 acres in a day to any depth down to 12 inches. To plow in the old way costs about $1.50, and fifty cents more for harrowing; while with the doctor's machine the cost is placed at about fifty cents per acre.

TO CROSS THE ATLANTIC IN FOUR DAYS.

A palatial steamer 700 feet long, with engines of 80,000 horse-power, and which is promised to cross the Atlantic in four days, has been designed by Camps & Piercy, naval architects of London. Oil will be the fuel used and the engines will be the latest type of steam turbines, which will reduce the weight of the machinery by one-half.

MACHINE TO CLEAN FISH.

A Swedish inventor named Elsenberg has constructed a machine which takes herrings as they come from the net, sorts them into the four sizes recognized by the trade, scrapes off their scales, cuts off their heads, splits, cleans and washes them inside and out. The machine does all this automatically, and turns out 20,000 herrings per hour. One of the big floating herring factories which go out from Goteborg to the herring banks is to be equipped with this astonishing apparatus, which ought to effect a revolution in the price of bloaters.

LIGHTEST WOOD KNOWN GROWS ONLY IN MISSOURI.

In the swamps of two counties in southeastern Missouri is found a tree known as corkwood, but which is even lighter than cork, which has a specific gravity of .240, while that of corkwood is only .207. The trees attain a height of 20 feet and a diameter of five inches; the wood is tougher than cork but can be dented with the thumb nail. It grows only on land which is always under water.

TRAVELING MEN USE AUTOS.

In the East, where the roads are generally good, two manufacturing concerns are sending out traveling men in automobiles. This mode of conveyance enables them to cover many small towns not on a railroad, and saves the time lost in waiting for trains. As high as 40 miles are made in one day taking in five or six towns. The traveling man carries his usual personal baggage and a full line of samples and printed matter. The novelty of the machine makes it a good advertisement.

An English inventor is reported in the English papers as having perfected a machine which drills square holes in metals. The drill is three-winged, semi-round and cuts four straight edges by a rotary motion.

A REMARKABLE PHOTOGRAPH.

This man is not sailing about among the tops of trees as might be inferred from the picture. He is merely leaping over a very high bar with the aid of a

Photo by L. B. Elliott—Made with Plastigmat Lens and Volute Shutter.

pole at the Rochester University. It is one of several pictures of pole vaulting taken in one afternoon to show what can be done in extra rapid photography.

USE ANTS TO STITCH WOUNDS.

Ants are used by the Indians of Brazil to stitch up wounds. The ants are a very large species that have mandibles which can bite through almost anything. When the ant catches hold with its jaws it cannot be made to let go. Even if the rest of the body is pulled off, these jaws still keep their hold. The Brazilian Indian catches some of the ants and holding them to the wound which he has previously closed, lets them bite. They fix their mandibles on each side of the wound and then the Indian pinches off the rest of the body. The jaws do not come apart and so a row of these ants' heads keeps a wound together as well as the surgeon's needle and wire would do, and as the bite of these ants is not poisonous this rough and ready surgery is quite efficient.

PSYCHILOID—A NEW INSULATOR.

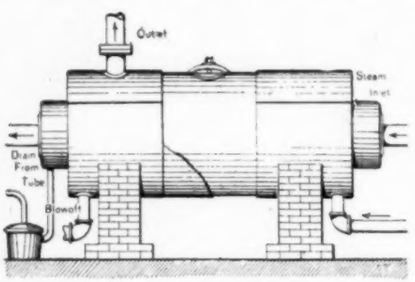
A new insulator called psychiloid has been brought out by a firm of that name in Sheffield, England. It can be cut and bored, and is claimed to have passed an insulation test of 7,500,000 ohms.

SHOP NOTES

HOME MADE WATER HEATER.

A discarded steam boiler unsafe for severe strains can be converted into an excellent heater to supply large quantities of hot water. The Engineer says the heating costs nothing, as exhaust steam otherwise going to waste does the work.

A boiler maker can rivet some caps upon each end, covering entirely the ends of the



A Good Heater.

tubes; these caps should be made of boiler iron, so that in case of a little back pressure upon the engine they will be sufficiently strong to withstand the pressure safely. In the center of each cap a hole is cut and a flange suitable for the exhaust pipe connection is riveted on. A large cold water supply should be arranged at the bottom of the boiler near the front end, also a hot water connection or outlet at the top near the back end, or the steam supply connection may be used instead. The size of these connections must be governed by the size of the boiler and the amount of water that is used per hour.

A blow-off pipe is essential for blowing off the accumulation of scale or mud, while the back cap must be provided with a hole for trap connections for removing the water of condensation, and an air vent on the top is sometimes desirable.

ATTACHMENT FOR LONG FILES.

The file attachment illustrated herewith is something which I find very useful, especially for heavy work, such as plow filing, says a writer in the American Blacksmith.

As is clearly shown, the device consists simply of a ¼-inch rod, one end of which

To Strengthen Long Files.

is bent to hook over the end of the file, while the other end passes through a hole in the handle and is threaded to receive a nut. By placing a block under the rod and tightening up on the nut, the file may be given a slight bow downward. This opens the teeth and makes the file cut better. In my opinion, also, it will last longer.

HOW PLATINUM IS REFINED.

There are two methods of refining platinum ore. One is known as the Wollaston. In this, after removal of the metals associated with platinum by the successive action of nitric and hydrochloric acids, the platinum itself is dissolved in aqua regia, from which it is precipitated by a solution of sal ammoniac in the form of a sparingly soluble double salt (ammonium platinochloride). This salt is washed and heated to redness, by which the chlorine and ammonia are expelled, leaving the metal in the form of a gray spongy soft mass, known to chemists as spongy platinum. In this form platinum cannot be fused into a compact form by ordinary furnace heat, but like iron, it can be welded at a high temperature. Accordingly, it is made into a thin paste with water, then introduced into a brass mold and subjected to a graduated pressure, by which the water is squeezed out and the mass rendered sufficiently firm to bear handling. It is then dried, very carefully heated to whiteness and hammered or subjected to powerful pressure. The Deville-Debray method: This is a very simple furnace. Two flat pieces of quicklime are scooped out, representing two cupels, and form the bottom and the lid of the furnace. The lower cupel has a notch cut in its side to serve as an exit for the liquefied platinum. The upper one is pierced at its center with a slightly conical round hole, through which the platinum nozzle of an oxyhydrogen blowpipe enters, so that the flame beats down on the metal within.

TALLOW FOR CUTTING TOOLS.

Tallow is better than the best lard oil in cutting threads in iron. A reader of the American Machinist tells how he accidentally found this out. He was cutting 1-inch taps and found it impossible to use the oil furnished him. Seeing an old piece of candle on the shelf he tried it with success. It is cleaner, does not run, and on small work the heat from the friction of the cutting tool and the center is sufficient to melt it as the tool goes along. In cutting inside threads it stays where needed, and is considered a great improvement over oil.

For cutting threads on copper use beeswax.

ANTIDOTE FOR AMMONIA FUMES.

Employes in ice and refrigerating plants are sometimes overcome by the fumes of the ammonia used in the process. In such case a good stiff drink of vinegar will help to counteract the action of the ammonia, revive the unconscious, and in many cases save life. If the victim is unconscious, it may be necessary to pry his jaws open to get the vinegar down.

COLORLESS VARNISH.

Colorless varnish for use on fine labels or other prints, as well as for white wood and other spotless articles, is made as follows: Dissolve two and one-half ounces of bleached shellac in one pint of rectified alcohol; to this add five ounces of animal boneblack, which should first be heated, and then boil the mixture for about five minutes, filter a small quantity of this through filtering paper and if not fully colorless add more boneblack and boil again. When this has been done, run the mixture through silk and through filtering paper. When cool, it is ready for use. It should be applied with care and uniformity.

HOW TO MAKE METAL POLISHES.

It is not difficult for any person to make his own metal polish. It can be done cheaply and will probably give you better satisfaction than the polish he buys. Here are a few recipes for good polishing soaps:

1. 20 to 25 pounds liquid curd soap, intimately mixed with about 30 pounds of fine chalk and one-half pound Venetian red.

2. 26 pounds liquid cocoanut oil soap, mixed with 12 pounds tripoli and 1 pound each of aum, tartaric acid and white lead.

3. 25 pounds melted cocoanut oil saponified with 12 pounds soda lye of 38 to 40 degrees B., after which 3 pounds rouge, 3 pounds water and 2 ounces ammonia are crutched in.

Polishing soaps are generally cut into cakes and stamped or pressed and brought into commerce with directions for use. The directions generally state that a small quantity of the soap is put on the metallic article to be polished with a damp flannel and rubbed until the desired polish is obtained.

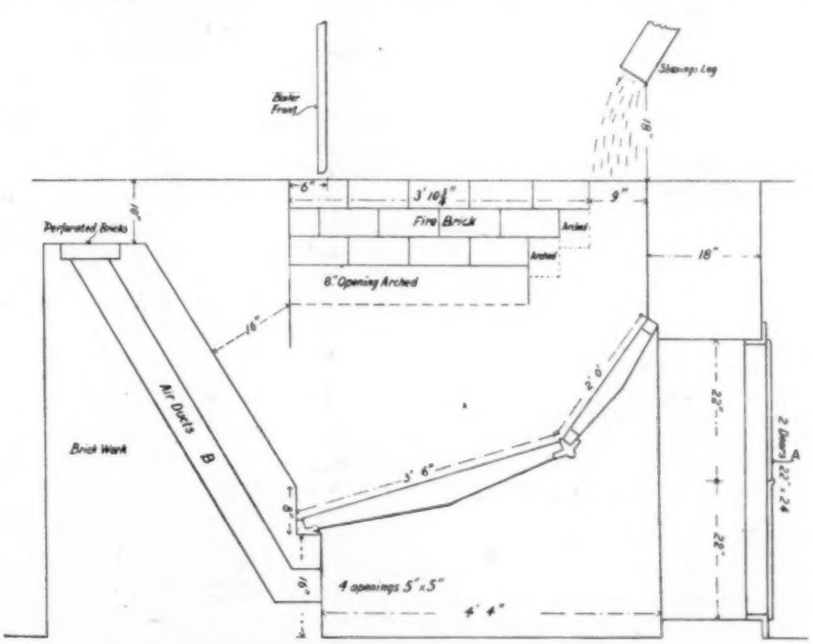
The price of pepper is going to keep on increasing. The world's supply is 25 per cent short. The United States uses 15,000,000 pounds of pepper a year.

FURNACE TO BURN SHAVINGS.

The illustration herewith shows a plan of a wood burning smokeless furnace devised by a correspondent of the Wood-Worker. He describes it as follows:

It will be noted that the floor of the boiler room is above the level of the grates. This permits of firing by dropping the fuel into the fire without the exertion of raising it, as is required in shoveling into an ordinary firebox. If the shavings exhaust is convenient, one or two legs may be dropped from the discharge pipe to about 18 inches to 2 feet above the floor of the boiler room, and the shavings may be dropped directly into the fire, giving an even heat as well as a saving of labor. The fire can not get up into the exhaust system, as there is no back suction, the only force being the attraction of gravity causing the shavings to drop, and it is never cut off, if the engine does shut down. A closely-shutting valve for regulating the feed should be arranged up near the junction with the separator, so that when not required on the fire the shavings may be run into the vault.

The draft may be regulated by opening or closing the feed hole in the floor above, or by manipulating the draft doors under the floor, as shown at A, Fig. 1. Note that the bridge-wall is built with several flues (B, Fig. 1), which admit air into the smoke chamber through the center of this wall. The oxygen coming in direct contact with the dense, hot smoke, combines with the carbon in it, adding to the heat of the direct fire, at the same time purifying the smoke. Another advantage is the ease with which the grates may be gotten at, to be cleaned or repaired, or the ashes removed.



SMOKE-CONSUMING WOOD-BURNING FURNACE.

TO KEEP INK BOTTLE IN DRAWER.

To keep the ink bottle, which is only used occasionally, always handy and at the same time out of your way, says the Draftsman, fasten a piece of pine about 1 inch thick and 2½ inches square, with a hole in the center the size of the bottle, in a corner of the instrument drawer; there is no danger of tipping the bottle over here and it is always ready for use.

STEAMSHIPS WASTE FUEL.

A modern first-class passenger steamship is a gigantic floating machine shop and coal yard combined. Her principal freight is 6,500 tons of machinery and 3,500 tons of coal. The American Shipbuilder says: "The fact that the power expended on propulsion represents only one-twentieth of the power contained in the coal consumed is so remarkable as to justify a brief consideration of the subject of heat as related to power. When oil takes the place of coal as steamship fuel, there will be a material change in carrying capacity."

WIRE SAW FOR CUTTING MARBLE IN QUARRY.

In the quarries of Italy and France great slabs of stone are taken out, a single piece often weighing many tons. This is accomplished by the use of what is known as a helicoidal wire, composed of three steel wires twisted together. When a block of marble is to be loosened two holes are drilled at what are to be the ends of the piece. The wire is made endless like a band saw and carried around pulleys. At each end of the piece a pulley is set in a frame which descends into the hole as the cutting progresses. The wire is driven at great speed and turns while moving. An engine furnishes the power, and sand and water are poured into the slot. When the bottom is reached the machinery is removed and the slab either broken off by driving wedges or a light charge of explosive. The helicoidal wire which cuts faster than a saw, is now being used for coal cutting in Belgium. For this purpose short wires with the ends bent out at right angles are twisted into the three main wires of the rope.

THE PRINCIPLE OF SWAGING.

Many smiths are apt to use too large a swage says the American Blacksmith. Fig. 1 illustrates the bad effect of doing this. The effect of the blows will be to cause the metal to move sideways in the direction A

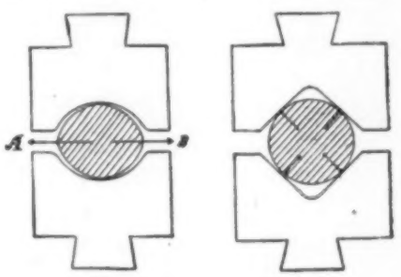


Fig. 1. Fig. 2.

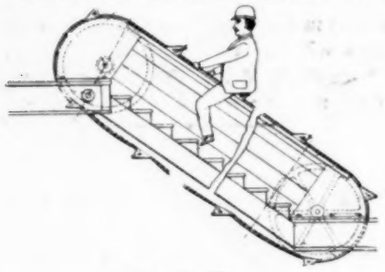
B, which will cause loose, spongy forgings, and frequently a hollow center. To overcome this we should use a swage as represented in Fig. 2. If we use this swage the metal is driven towards the center, and as a consequence there is no danger of the work becoming hollow in the center, besides it makes the forging more compact or dense.

SUBSTANCE USED IN MAKING PAINTS.

In the manufacture of artists colors animal, vegetable and mineral substances are largely used. As told in a previous issue of Popular Mechanics the finest brown paint used by the artist is made from Egyptian mummies ground down by machinery and turned into a beautiful brown liquid coloring. Crimson and purple lakes and carmine are all obtained from the cochineal insect. Sepia is the dark fluid discharged by the cuttlefish to render the water opaque for its own concealment when attacked by a larger fish. Prussian blue is made by fusing the hoofs of horses with impure potassium carbonate, and ultramarine is obtained from the precious mineral known as lapis lazuli. Gambodge is the yellow sap of a tree which grows in Siam, and raw sienna is the natural earth from Sienna; when burned it becomes burnt sienna. Turkey red is made from the Indian madder plant. There is only one color that American people do not know how to produce and that is India ink. Only the Chinese can make it and they refuse to divulge the secret of its composition.

MECHANICAL STAIR CLIMBER.

The man in the picture is not sliding down the banisters in revival of his boyhood days; on the contrary he is going up stairs a great deal faster than he would walk, and will not be out of breath on reaching the top. The machine consists of an endless belt with seats attached at suitable intervals, the belt passing around one wheel at the foot of the stairs and another at the top. To ride you simply straddle the belt, in a standing position and the first seat that comes along does the rest. On reaching the top the rider is delivered on the floor on his feet. The inventor, Jesse Reno, has in operation several successful moving stairways.



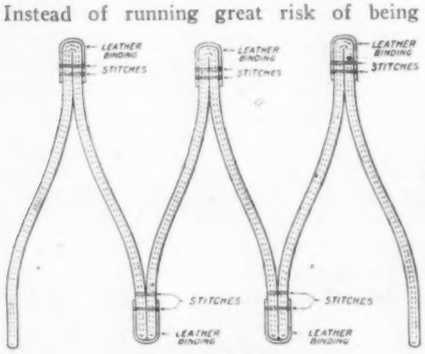
This Is Easy.

QUARRIES WORKED 100 YEARS.

In widening London bridge the granite will be taken from the same quarries from which the original material of the structure was obtained—the famous Darthmoor quarries, which have been worked without stopping for nearly a century. The Granite Cutter's Journal says: "Stone for the addition to the bridge will be worked both at the quarries and in London, about 500 men being employed. Six hundred coping stones will handle to be dressed into shape, each one weighing three tons. In view of the magnitude of the work improvements will be instituted at the quarries. Steam drills will be used and blasts will be fired by electricity."

HOW VESTIBULE CARS ARE CONNECTED.

The passenger on a vestibuled train can pass from the forward to the rear car without the need of even wearing a hat. Instead of running great risk of being blown from the platform, he feels no wind and smoke and cinders are kept out. The ends of each car are equipped with bellows or diaphragms which are tightly fastened together when the cars are coupled. In order to allow for swaying of the cars, passing around curves, etc., these diaphragms must admit of being pulled apart or squeezed, as the case may be. They were first made of leather, then rubber, and now of cotton belting. The cut shows manner of construction.



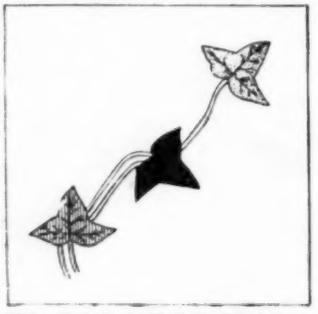
The Diaphragm.

NEW INDUSTRY FOR PACIFIC COAST.

Pacific coast oysters are very small, three dozen being about equal in bulk to one dozen of the ordinary eastern variety. Experiments in planting Baltimore oysters in Puget Sound are proving successful and the West in a few years will doubtless have an immense new industry. The warm currents which sweep down our western coast, together with the abundance of semi-fresh water bays where the oysters can be fattened combine to make very favorable conditions.

MAKING DECORATIVE TILE.

Decorative tile for walls and floors is being made by a new process in Belgium. The prepared clay is rolled flat and stamped out in a press to the desired size and shape. The colors in the form of a powder are then spread on, one at a time, and then placed under heavy pressure.



This Requires Skilled Workmen.

The mass is then fired in a kiln, after which skilled workmen remove portions of the layers so as to bring out the different shades and shapes of leaves, vines, etc.

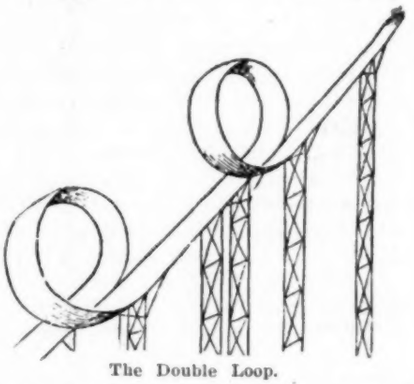
WANTED, A WOMAN INVENTOR.

The Women's Educational and Industrial Union has offered a prize of $50 for the best device for saving of labor in a household, designed by a woman. The club manager said:

"It is with the hope of stimulating the inventiveness of women and their interest in applying science to daily living that the prize is offered. Designs may be submitted up to Oct. 15. Further particulars may be had on application to the Home Economics committee, 264 Boylston street, Boston.

TO MAKE A DOUBLE "LOOP THE LOOP."

Harry King, trick bicyclist of Lafayette, Ind., will construct an apparatus on which he proposes to perform the most daring bicycle feat ever attempted. It is a double "loop-the-loop," which will make Diavolo's single loop performance seem like a child's somersault in comparison. King intends to start from an elevation of 60 feet down a 45 degree incline five feet wide and strike the beginning of the first loop 60 feet from the start. This loop is to be 20 feet in diameter and 35 feet above ground. Circling this loop at terrific speed King will descend another incline to the second loop, 22 feet in diameter and about 10 feet above the ground.



The Double Loop.

PARCELS POST TO GREAT BRITAIN.

Under an arrangement made between the American Express company, the Cunard and White Star Steamship companies, and the post office department of Great Britain parcels may now be exchanged between the two countries at low rates. The parcel must not exceed 3½ feet in length, and length and girth combined must not exceed 6 feet. The rate west to New York City is 3 pounds or less, one shilling; 3 to 7 pounds, two shillings; 7 to 11 pounds, three shillings. To other parts of the United States a small extra charge. In addition to custom duties, if any, the express company charge 25 cents for clearing the custom house, and the government charge 25 cents as storage fee. This makes a 3-pound parcel or less cost from England to New York City 75 cents plus duties; to Chicago and points east of the Rocky Mountains $1. The west-bound service is already in effect; east bound begins this month. Parcels will be accepted for transmission to any post office in Great Britain at any office of the American Express in the United States.

The most valuable cotton known is grown on the sea islands of South Carolina. There are but about 10,000 bags, weighing 360 pounds each, grown per year, but it sells at from 20 to 60 cents a pound.

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Weight 3¾ pounds. Will light our 6 c. p. lamp, ring bells, explode powder. Output 10 watts. As a motor will develop 1-32 h. p. Wound for voltages 4 or 6 as desired. Other voltages up to 110 to order. ☞ *Send 2-cent stamp for illustrated* circulars.

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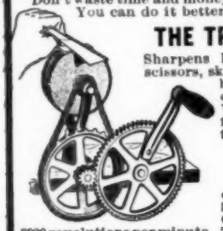

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GRIT.

Feller thet no obstickel
Here on earth kin stop
Is th' chap thet's goin' tew land
Clean up on th' top.

Feller thet kin take a blow
Right between th' eyes,
An' keep on—why, he's th' chap
Thet is goin' tew rise.

Feller thet keeps pushin' on
When it's black es sin,
Is th' feller you kin bet
Is a-goin' tew win.

Feller thet kin say to fate,
"You can't keep me down!"
Is th' chap thet's goin' tew wear
Jewels in his crown.

—Ohio State Journal.

FASTEST WAR VESSEL IN THE WORLD.

The British first class armored cruiser Drake, 14,100 tons, in the recent engine trials proved that she is the fastest war vessel in the world outside of torpedo boat destroyers. The Drake made 24.10 knots, which high speed was partly due to an improved type of propeller. The contract provided for a speed of 23 knots.

ELECTRIC FIRE ENGINE.

And now an electric fire engine. Electricians have talked for a long time about such a machine but it has been left for a captain of a fire company in Rouen, France, to actually build one. The pump is driven by a motor, both being carried on a two-wheel cart and can be drawn by one horse. On arrival at the fire electric current is secured by connecting with the trolley wires of the street railway, or electric light wires. A long pole with wires is used to make connection. The pump throws a stream more than 100 feet.

THE MANUAL OF BUSINESS.

Everything you need know about business, that business references can tell, is given in a recent manual issued by the American Artisan. It is entitled "The Manual of Business," and is intended as a reference book for retail merchants. There is probably no person in any walk of life, however, that would not find much information of value to him in this handy volume. The manual is compiled by Sidney P. Johnson and Daniel Stern, 69 Dearborn street, Chicago, is publisher.

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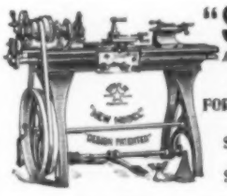

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WANTED—At once, a No. 1 tinner and cornice worker; good at all kinds of jobbing and one that can do a job of slating. Must be sober; steady job to the right man. James Rostron, Sidney, Ohio.

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